

M. H. Hitchcox

ADJUSTMENT SEQUENCESECTION IWedge Shaft and Carry Shaft (60-3000 $\frac{1}{2}$)

- 1 Remove carriage from machine. Check the wedges for free movement and their springs for sufficient tension.
- 2 See that the intermediate gears are free, have a minimum of side play and that the check spring is properly tensioned.
- 3 Position the carry shaft sidewise for approximate $\frac{1}{32}$ " clearance between carry drums and intermediate gears. Remove excessive end play from carry shaft.

SECTION IISelecting Shaft and Keyboard (60-200 $\frac{1}{2}$ x1, 60-100 $\frac{1}{2}$)

- 1 Adjust selecting shaft for slight side play by bending sidewise the forward extension of set-up cam plate.
- 2 With keyboard cleared, obtain sidewise clearance between selecting gears and intermediate gears by bending the forward protrusions of intermediate section.
- 3 Align the keyboard for $\frac{2}{3}$ to a full hold of selecting gears with intermediate gears.
- 4 Check all numeral keystems for freedom and for restoring of one another.

SECTION III

Plus and Minus Keys

- 1 Adjust the plus-minus rocker shaft for slight end play and the shaft latch for safe entry into notch in clutch yoke positioner.
- 2 Remove end play from rock lever shaft. Align cycle stopping arm latch sidewise with trip lever flexible end.
- 3 Set cycle stopping arm limit blank to obtain $\frac{1}{32}$ " clearance of cycle stopping arm latch over rocker lever (with trip lever downward).
- 4 Adjust length of rock lever link for $\frac{1}{32}$ " clearance of rock lever behind rear extension of cycle stopping arm latch (with trip lever raised). Align rock lever sidewise with cycle stopping arm latch.
- 5 Raise or lower rear extension of cycle stopping arm for proper neutralizing of clutch yoke.
- 6 Shorten or lengthen cycle stopping arm for equal hold of plus and minus claws of clutch yoke with transmission. Note: Depth of hold should be approximately $\frac{1}{16}$ ". Under no circumstances should plus or minus claws be bent or peened.
- 7 Check cycle stopping arm for freedom and align cycle stopping arm link for slight sidewise clearance from stud on rock lever link. Cycle stopping arm link should not spring sidewise in either direction.
- 8 Adjust clutch yoke click to the neutral notch in clutch yoke.
- 9 Adjust switch closing arm to clutch yoke operating stud keeping high point of eccentric downward. Adjust switch blades for minimum of tension and approximately $\frac{1}{32}$ " gap with clutch yoke in neutral. Note: Motor should start before clutch yoke engages transmission.
- 10 Adjustable stud on switch closing arm should be set for clearance above clear-out switch operating arm when clear trip link is latched.

SECTION III (Cont'd)

- 11 Set the adjusting blank on the clutch yoke for a full throw of clutch yoke from the plus and minus keys.
- 12 Make sure that trip lever and trip rocker are absolutely free and set the trip lever flexible end for approximately $1/32$ " depth of hold with cycle stopping arm latch. Adjust the rear extension of the trip lever to the thru carry gear for approximately $1/32$ " lift of trip lever flexible end above cycle stopping arm latch. Trip lever should not limit on gear teeth.
- 13 Adjust bracket of machine stop lever for approximately $1/64$ " lift of trip lever flexible end above cycle stopping arm latch.
- 14 Adjust forward off-set of quick stroke latch for a simultaneous latching of this latch and trip lever; also adjust for excess opening between sub-lever and machine stopping lever after its flexible end moves from under the trip lever lug.
- 15 The rear off-set on the quick stroke latch should be bent to position against cycle stopping arm when machine stopping lever is latched.
- 16 Adjust limit blank for scissor locator toggle to hold forward roller of toggle with very slight clearance from high point of cam when locator toggle is made.
- 17 Adjust eccentric stud on rear extension of locator toggle to hold the toggle forward against its limit blank and to also hold the shift keys to their upward limit.
- 18 Adjust the locator toggle breaking arm on its pivot shaft to remove end play from the shaft and to "break" the toggle when the cycle stopping arm is approximately $1/32$ " from the bumper pad.
- 19 Adjust locator cam on R.H. end of jack shaft for equal movement from center position during plus and minus bumper strokes.

SECTION IV

Shift Mechanism

- 1 *(old style)* Close up prongs of shift operating lever guide bracket to remove excessive side play of shift lever and form the rear extension of lever to hold shift trip pawl down to limit against rocker shaft when front extension holds shift keys up to their limit. Shift operating lever should hold shift trip pawl with only slight side play at its lower end. Free shift keys and shift operating lever so that shift keys drop of their own weight with lever held down at front end.
- 2 Adjust shift control shaft sidewise for approximately $1/32$ " clearance between rocker shaft arm and the arm on left-hand end of shift control shaft.
- 3 Adjust shift trip lever to hold shift trip pawl with slight side play and to hold arm on left-hand end of control shaft approximately $1/32$ " below rim of tripper disc when shift trip lever is limiting against rocker shaft.
- 4 Set shift toggle tripping blank for $1/64$ " clearance behind toggle off-set.
- 5 Adjust friction shaft to have slight end play.
- 6 Adjust shift toggle clamp sidewise for full re-setting of toggle from shift drum. Toggle must be absolutely free with its spring disconnected.
- 7 The adjustable bracket for the friction housing roller arm should be set sidewise on cross brace to obtain approximately $1/64$ " clearance of shift drum clutch arm from pawl in drum when shift toggle is fully "broken."
- 8 Set machine friction adjusting nuts to obtain approximately $1/16$ " gap between machine friction spring arm and bracket with shift toggle fully made.

SECTION IV (Cont'd)

- 9 With shift drum neutral, bend upper L.H. extension of shift worm stopping latch forward or rearward so that approximately $1/2$ of roller on latch protrudes behind rim of tripper disc.
- 10 With shift drum at $1/8$ turn, bend forward extension of worm stopping latch for $1/64$ " clearance of roller arm behind tripper disc. *now eccentric*
- 11 Form flat stock at rear of stopping latch for full forward movement of its upper right-hand extension when latch is held forward by stud on tripper disc. *2 bends*
- 12 Raise or lower upper right hand extension of worm stopping latch to provide free entry of roller into cut of tripper disc when rotating worm shaft fully in either direction with shift drum at $1/8$ turn.
- 13 With tripper disc held to right by arm on L.H. end of shift control shaft, bend forward extension of stopping latch sidewise for $1/32$ " sidewise clearance from stud on tripper disc. With toggle made, bend tripper disc restoring arm to provide same condition. *restoring arm*
- 14 With shift drum at half way position, ~~turn~~ *turn* eccentric stud in restoring roller arm for safe but not full downward movement of division shaft re-setting cam. In same drum position, adjust downward extension of cycle stopping arm link for full movement of cycle stopping arm to bumper.
- 15 Remove all end play from worm shaft.

SECTION V

Carriage Contents & Setting

- 1 Remove sub-carriage. See that upper and lower dials and intermediate gears are free and do not have excessive side play. Check pawls must be free.
- 2 Straighten and align carriage.
- 3 Check dial clear shafts and linkages for free movement.
- 4 Check counting fingers for freedom and springs for sufficient tension.
- 5 Align hinge rod brackets and clearing arms with aligning rod and install carriage on machine. Back out adjusting screws in carriage end plates.
- 6 Adjust carriage for proper forward, rearward and sidewise mesh of lower dial intermediate gears with machine intermediate gears.
- 7 Loosen carriage raising arm clamps and back out set screws to drop carriage fully into mesh, then adjust set screws to raise carriage $1/2$ turn of screw above full depth of mesh.
- 8 Take out play (downward) in carriage raising arms and retighten clamps.
- 9 Run thru tests for proper calculation using plus and minus bars.

SECTION VICarry Counting & Change Lever (60-8000 $\frac{1}{2}$ xl)

- 1 Align carry counting cam shaft for equal sidewise hold of either driving cam with fork on carry counting assembly.
- 2 Bend counting finger assembly fork for equal displacement of upper dial gears by first counting finger. Fork should have only slight play on cams.

SECTION VI (Cont'd)

- 3 Bend left-hand extension of counting finger assembly to give equal displacement of upper dials in both directions by left-hand carry finger.
- 4 Bend forward off-set of change lever link latch up or down for safe clearance of step on link to move over off-set of latch as change lever is moved manually.
- 5 Rear off-set on change control lever should be bent up or down to prevent movement of change lever by clamp arm during division when change control lever is forward.

SECTION VII
Dial Clearout

- 1 Set clear keys level with C.P. Set-Up key, and make sure that clear slides are absolutely free.
- 2 Remove end play from carriage raising shaft and clearing shaft, and check for sidewise clearance of carriage raising roller arm from clear drum drive gear.
- 3 With clearout slides to the right and clear trip link in forward position, check for approximately $1/32$ " sidewise movement of slides.
- 4 Bend upward extension of clear trip link latch to lay evenly against left-hand end of all clear slides, and bend forward extension of latch to release trip link approximately $1/16$ " before clear keys bottom. Bend forward extensions of latch upward to obtain full depth of hold with trip link.
- 5 Bend dial clearing arms for approximately $1/16$ " sidewise clearance from studs on clearing couplers.
- 6 With all clearing slides to left and clear drum at halfway position, adjust arm on left-hand end of clearing shaft to fully re-set zero keys without cramping.
- 7 Adjust upper and lower dial clear clamps to fully clear dials with slight after pressure. Caution: In setting clamps, care should be taken to see that sidewise position of clamps does not limit full movement of slides to right and left.
- 8 Driving arm for power link should be set-screwed to R.H. end of clearing shaft so that it does not interfere with full sidewise movement of keyboard clearing slide.
- 9 If necessary, bend restoring tails of clamps sidewise to align with clearing arms. Bend tails up or down to restore clearing arms to point where dial clear locking shafts may be moved freely sidewise. Bend clearing arm limit blanks to hold clearing arms up against restoring tails on clamps with clear shaft neutral.
- 10 Clear trip link must be absolutely free all the way forward and rearward.
- 11 With trip link held in blocked multiplication position, adjust rock lever to just clear under operating stud on clutch yoke. *U lock*
- 12 Shorten or lengthen lock lever by bending at its off-set forming to provide safe blocking of lever by clutch yoke operating stud with clutch yoke in plus or minus. Bend lock lever sidewise for safe sidewise clearance from clutch yoke click and switch closing arm.
- 13 Adjust clear clutch arm on lock lever shaft to safely re-set clear trip link behind the longer of two latches when upper extension of clutch arm is on pin in clear drum.

SECTION VII (Cont'd)

- 14 In blocked multiplication position, adjust eccentric screw at rear end of off center blocking lock to hold clear trip link blocked in same position as it is held by multiplication clear blocking lever.
- 15 Adjust eccentric hub for machine toggle latch so that latch does not cramp against stud on toggle breaker assembly when stud on clear drum is under clear clutch arm and so that latch will not block toggle when trip link is in blocked multiplication position.
- 16 Adjust carriage raising roller arm to move fully up into cut in clear drum, and see that spring arm on right-hand end of shaft clears below shift lever by approximately $1/4$ ".
- 17 Adjust eccentric stud at rear of carriage raising roller arm to hold roller on carriage shift raising arm all the way up into cut in shift drum cam.

SECTION VIII

Set-Up

- 1 Make sure that set-up toggle is absolutely free and that its spring at front end has sufficient tension to fully set N.R. key. Bend rearward extension of toggle arm forward so that its stud does not limit full forward movement of sub-carriage positioner disabler slide.
- 2 Rear extension of lower toggle arm should be bent inward to hold gear 60-7752 with slight side play.
- 3 With set-up toggle broken, adjust limit plate to hold minus throwing arm with very slight clearance behind roller arm of set-up yoke positioner. Caution: Too much clearance at this point will result in limiting of minus throwing arm from moving far enough forward for full rearward movement of yoke throwing lever in minus.
- 4 Bend forward lug of yoke throwing lever for full movement of clutch yoke in plus (do not bend more than necessary).
- 5 On plus bumper stroke, check to see that stud on rear of set-up toggle arm does not cramp full movement of set-up cam.
- 6 After plus bumper stroke, check to see that rear lug on yoke throwing lever is formed to fully move clutch yoke fully into minus.
- 7 Bend rear extension of lower set-up toggle arm for full restoring of set-up toggle on minus cycle.
- 8 If stud on gear tends to jam against point of toggle resetting blank during minus set-up cycle, bend forward extension of toggle arm upward to limit sooner against stud on repeat key. This will lower rear tip of toggle re-setting blank.
- 9 Form yoke throwing lever latch for safe latching and releasing of lever.
- 10 Check sub-carriage for freedom of multiplication dials, constant gears and storage gears. Check feeler fingers for freedom and alignment across front edge of their forward extensions.
- 11 Check sub-carriage hinge rod for straightness and assemble sub-carriage to carriage.
- 12 Sub-carriage hinge rod must turn freely and hold sub-carriage so that teeth of storage gears cannot trip on lower dial intermediate gears as sub-carriage is moved sideways. Sub-carriage should be held forward for safe clearance of lower dial intermediate gears from flanges on storage gears.

(SECTION VIII (Cont'd))

- 13 Remove excessive sidewise play from sub-carriage shift lever and position shift lever sidewise by use of shims to hold storage gears with approximately $1/64$ " sidewise clearance from lower dial intermediate gears with transfer lever latched and sidewise play in sub-carriage taken out to the left.
- 14 Form constant comb latch so that it cannot ride over or under right-hand extension of comb, and check for safe sidewise clearance of latch from comb with sub-carriage in first position.
- 15 Adjust guide at left-hand end of constant comb for parallel movement of comb and bend upper left-hand extension of constant lever for full hold of comb teeth with constant gears. Note: Slot in L.H. end of constant comb may be cut deeper to obtain more movement of comb to left.
- 16 Bend right-hand extension of comb forward or rearward for clearance behind comb latch.
- 17 Form transfer slide so that its lower edge lays against carriage and its right-hand upright so that lug on sub-carriage cannot ride under it on a transfer operation.
- 18 Form sub-carriage driving cam so that its left hand edge lines with left-hand edge of holding cam on right hand end of selecting shaft.
- 19 Install carriage on machine and set headed adjusting screw in right-hand carriage end plate to prevent leftward drift of carriage during multiplication set-up.
- 20 Lower extension of R.H. end plate in sub-carriage should be bent to left to give sufficient movement of sub-carriage to the right for safe relatching of transfer lever on a transfer operation. Note: Control for return of sub-carriage on transfer is the limiting of forward extension on sub-carriage positioner against screw in side frame.
- 21 With carriage in first position, adjust unheaded screw in right-hand carriage plate to hold sub-carriage fully to the right for safe latching of transfer lever. Caution: Do not set the screw in to point where it prevents full return of disabler slide after multiplication set-up.
- 22 Headed adjusting screw in left-hand carriage plate should be set to move flexible end of shift control bar under shift disabler. Note: Do not adjust screw to move shift control bar fully to the right.
- 23 Adjust keyboard clearing kicker disabler sidewise to hold kicker in line with left-hand edge of rear extension on trip bell crank. Form disabler to lay up against bracket and to safely engage carriage lug and with safe clearance from transfer slide. Make sure that disabler and kicker move freely sidewise.
- 24 Form keyboard clearing and trip bell cranks so that kicker will properly engage keyboard bell crank in its lowered position; also to clear over keyboard bell crank and safely engage trip bell crank in its raised position during multiplication set-up.
- 25 With carriage in first position, bend top of kicker forward or rearward for release of all keys at end of forward movement of kicker. On a hand multiplication set-up operation of machine, make sure that kicker moves down freely to engage keyboard clearing bell crank during minus cycle.
- 26 Move forward extension of trip rocker up or down to obtain $1/64$ " lift of trip lever above cycle stopping arm latch during plus and minus set-up cycles with carriage in first position.

SECTION VIII (Cont'd)

- 27 With carriage out of first position and N.R. key down, adjust keyboard lock (clamped to rock lever shaft) for approximately $1/64$ " clearance of lock under locking bail when kicker has its maximum forward movement.
- 28 Install shim washer behind driving stud for sub-carriage, if necessary, to obtain at least $2/3$ sidewise mesh of storage gears with lower dial intermediate gears on a multiplication set-up.
- 29 Constant comb positioning fingers should be set on left-hand end of sub-carriage rod for approximately $1/64$ " clearance of rear finger behind left-hand extension of comb with carriage fully seated and constant lever neutral.

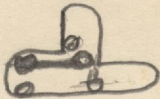
SECTION IX

C.P. Set-Up

- 1 Form left-hand downward extension of operating arm for return lever quick stroke latch to lay flush against all three clear slide bell cranks. Form right-hand off-set of operating arm to hold upward extension of quick stroke latch approximately $1/64$ " away from off-set lug on carriage return lever (clear slides neutral).
- 2 Bend forward extension of locator toggle breaker forward or rearward to enter approximately halfway in narrow part of cut at rear of shift reversing swivel.
- 3 Check to see that index plate moves freely and that its toggle spring has sufficient tension to hold plate fully positioned forward and rearward.
- 4 Run clear drum halfway through a dial clearing cycle, raise return lever to its latched position and form off-set on return lever lug to have a good latching angle with quick stroke latch and to hold rear end of return lever above right-hand extension of shift reversing swivel with approximately $1/64$ " clearance.
- 5 Leaving clear drum and return lever as above, move index plate rearward, and check to see that hub of shift reversing rocker limits against side frame and that rocker has a full sidewise hold on stud of upper shift key; then move index plate forward and check for free movement of rocker to the right and a full sidewise hold of rocker over lower shift key stud. To secure above conditions, it may be necessary to form power link to prevent its cramping rocker and to bend forward extension of shift rocker sidewise.
- 6 Bend forward extension of C.P. Set-Up lever to allow cut at rear extension of return lever to rest fully down on swivel and off-set lug of C.P. Set-Up lever. Move return lever forward or rearward to obtain sidewise clearance of rocker from either shift key stud. Note: Slight bending of rocker sidewise may be necessary to obtain this condition.
- 7 With clear drum neutral, raise return lever and bend forward extension of toggle breaker sidewise for clearance of rocker from either shift key stud (index plate forward and rearward). At the same time, bend rearward extension of shift disabler up or down for safe latching under and over flexible end of shift control bar.
- 8 Under power (index plate in both positions) check for full pull-down of shift keys on C.P. Set-Up and clear operation. Also check to see that right-hand extension of yoke throwing lever is safely blocked by end of carriage return lever when carriage return lever is held up by swivel.

SECTION X
Division

- 1 Remove excessive end play from division rocker shaft and position shaft for sidewise alignment of its roller arm with clutch yoke click.
- 2 Check clearance between division restoring roller and clutch yoke click eccentric. Bend roller arm rearward for clearance.
- 3 Set shift control latch disabler to top of slot in division shaft roller arm. *old style*
- 4 Form division tripping link for freedom and clearance from transmission.
- 5 Trip division shaft and check for full free movement of division shaft (division re-setting cam held to limit against clutch yoke click stud) and adjust index plates setting arm for full movement of index plate forward.
- 6 Set butterfly positioning link all the way forward with slight clearance from butterfly shaft.
- 7 With machine toggle fully made, adjust yoke throwing links (through bending at formings) to hold links so that the ends of their slots move up to butterfly shaft and switch closing arm stud without cramping. Caution: Unless these links are absolutely free, it will be almost impossible to have plus-minus control blanks operate properly.
- 8 Temporarily set eccentric butterfly stud down and halfway to the rear and make sure that control blanks are absolutely free.
- 9 Turn eccentric stud on butterfly positioning link down and to the rear to point where latch on outer control blank just clears over stud during minus fire of clutch yoke (inner yoke throwing blank forward).
- 10 If necessary, move butterfly positioning link rearward to obtain safe unlatching clearance of outer control blank latch from positioning link eccentric stud when outer link moves forward for plus fire of clutch yoke. Caution: Do not move so far rearward that depth of hold of control blank latch on eccentric stud becomes critical.
- 11 Bend upper extension at forward end of butterfly positioning link forward or rearward to break machine toggle just before division shaft limits in its forward movement.
- 12 Bend off-set lug on division roller arm to hold clearing lock lever with $1/64$ " clearance from clutch yoke operating stud.
- 13 Adjust toggle tripping pawl to "break" machine toggle when cycle stopping arm is approximately $1/32$ " from bumper pad. Adjust tripping pawl guide bracket up or down for good hold of step in pawl with off-set on upper extension of machine toggle. Upper extension of toggle should be bent in for safe sidewise hold of its off-set with toggle tripping pawl.
- 14 Bend limit lug on shift trip link guide bracket to hold rocker at rear end of link up to arm on left-hand end of shift control shaft. Form trip link for safe sidewise clearance from minus arm of clutch yoke.
- 15 Bend off-set on shift trip link rearward so that shift toggle "breaks" simultaneously with "breaking" of machine toggle.
- 16 Bend rear extension of shift control latch up or down so that its forward step just clears over off-set on shift trip link on minus bumper stroke.
- 17 Adjust length of toggle, re-setting link and its downward extension to fully "make" machine toggle from rocker lever and worm shaft.
- 18 With division and multiplication shafts neutral, bend forward extension of toggle tripping pawl up or down to obtain approximately $1/64$ " clearance over off-set on machine toggle.

SECTION X (Cont'd)

- 19 Adjust change lever positioning arm (clamped to right-hand end of division shaft) to provide slight clearance of step in positioning link behind stud in positioning arm. Positioning arm should also be set for safe sidewise clearance from repeat setting link and shift lever.
- 20 Adjust eccentric collar on division key restoring rocker for full re-setting of division key without cramping.
- 21 With division shaft tripped and shift drum at 1/8 turn, check to see that there is slight clearance for passage of re-setting blank under eccentric stud on restoring roller arm. *(when key restores)*

SECTION XI

Multiplication (Three Keys)

- 1 Remove carriage. Set minus multiplication arm to hold "-X" key fully upward against plate, also to hold "-X" key aligned straight (multiplication shaft to the right with slight clearance between its right-hand end and change control lever).
- 2 Adjust multiplication shaft hold-down arm to raise approximately 1/16" above sub-plate latch when "-X" key is fully depressed and to align side-wise with downward extension of trip rocker and sub-plate latch. Form trip rocker to lay in toward side frame.
- 3 Adjust trip rocker by bending its downward extension forward or rearward so that elongated slot of trip rocker does not cramp rearward against its guide and pivot screw when multiplication shaft is in neutral.
- 4 Adjust rear extension of trip rocker for safe entry of its stud into narrow aperture of trip lever with multiplication shaft neutral and safe divorcing action from narrow aperture with multiplication shaft latched.
Note: After making above adjustment, it will be necessary to raise or lower front end of rocker for proper tripping action on multiplication set-up operation.
- 5 Adjust guide bracket for multiplication trip latch to hold latch with approximately 1/64" clearance in front of off-set on trip rocker with multiplication shaft neutral. Make sure that bracket does not cramp upward movement of latch.
- 6 Adjust arm on left-hand end of multiplication shaft to break machine toggle after multiplication shaft is latched and before "-X" is fully depressed.
- 7 Adjust control arm for clear blocking lever to hold forward extension of lever with safe latching clearance above its hold-up latch. Note: The sidewise position of arms mentioned in parts 6 and 7 controls the side-wise position and amount of end play in multiplication shaft.
- 8 Adjust keyboard clear control arm assembly on multiplication shaft to hold "X" key and universal bail up to their limit and aligned properly sidewise.
- 9 Form multiplication universal bail to bring both hold-down arms even at their rear extensions and to hold plus-minus control blanks safely in their plus position when universal bail is latched.
- 10 Bend lug on C.X. bail so that depression of "CX" key will rotate multiplication shaft the same distance as caused by full depression of "-X" key.

SECTION XI (Cont'd)

- 11 Bend forward extension of carriage return lever to lay up against stud in CX bail.
- 12 Adjust plus and minus lock slide for slight clearance of roller on multiplication counting finger raising arm behind step in lock slide. Keep lock slide straight in its guide slot and check for safe latching of upward extension on slide when carriage is out of first position.
- 13 With multiplication shaft neutral and N.R. down, adjust repeat setting blank on slide rearward to lay against lug on repeat-non-repeat swivel.
- 14 Bring feeler bail and cam into alignment at high point of their rear surfaces by bending left-hand extension of cam forward or rearward. Install carriage on machine for following adjustments.
- 15 With multiplier dials at zero (feeler bail and cam fully rearward) adjust feeler bail linkage to hold sub-plate latch with approximately $1/64$ " clearance behind hold-down arms.
- 16 Adjust feeler cam linkage to raise multiplication trip latch for approximately $1/64$ " clearance above off-set at front end of trip rocker with feeler cam held by forward positioned feeler finger and also to raise trip lever at least $1/64$ " above cycle stopping arm latch as feeler cam moves rearward. Note: Check in all carriage positions and make any necessary compensating adjustment to feeler cam link as may be necessitated by variations in feeler cam movement in any carriage position.
- 17 Check sidewise alignment of shift feeler arm with rear extension of butterfly and close guide blanks to hold shift feeler arm with slight side play.
- 18 Adjust butterfly clamp to rotate butterfly for safe clearance of shift feeler arm under rear extension of butterfly when feeler cam is held forward by feeler fingers. Caution: Do not set butterfly to point where it is prevented from limiting against sub-plate stud as feeler cam moves rearward.
- 19 Eccentric stud on butterfly should be set to hold plus-minus control blanks in their plus position with feeler cam fully rearward and to move control blanks to their minus position when feeler cam is moved forward by feeler fingers.
- 20 With multiplier dials at zero (feeler cam fully rearward) and carriage in shift raised position, adjust stud in elongated slot of carriage raising arm to hold feeler cam linkage bell crank with slight play between stud on feeler cam linkage and adjustable stud on raising arm.
- 21 In multiplication shift (hook holding square stud at front of shift trip link) bend right-hand off-set on machine toggle breaker assembly to obtain slight clearance of off-set under lower extension of hook.
- 22 Bend lower extension of shift feeler arm forward (if necessary) to obtain sufficient forward movement of shift trip link for safe clearance of step on hook behind square stud on link.
- 23 Bend rear extension of hook down to obtain safe depth of hold of hook on square stud. Caution: Before bending hook, make sure that butterfly is fully neutralized (resting against sub-plate stud).
- 24 Close guide lugs on intermediate section to hold multiplication counting finger in correct sidewise alignment with storage gears. Guides should hold finger with only slight play and finger should be absolutely free.

SECTION XI (Cont'd)

- 25 Bend upward extension of multiplication counting finger operating arm forward or rearward for full displacement of storage gears and multiplier dials. Note: Forward extension of multiplication counting finger raising roller arm may be bent downward to increase spring tension for raising of counting finger.
- 26 Bend upward extension of guide bracket for multiplication counting finger link to hold counting finger fully down to collar on intermediate gear shaft when machine is on center. Caution: Excessive forward bending of this bracket may cause failure of counting finger to occasionally count out storage gear properly.
- 27 Raise or lower carriage positioning latch so that its downward extension has only slight clearance to latch over forward extension of feeler bail when feeler bail or feeler cam are held forward by any feeler finger. All up and down play should be removed from latch.
- 28 Bend carriage positioning latch to clear in front of forward extension of feeler bail by approximately $1/64$ " when latch is held forward by transfer slide.
- 29 With carriage in first position and transfer slide to the right, form right-hand lower edge of transfer slide in toward carriage, and if necessary, remove stock from lower edge of slide to permit sufficient rearward movement of carriage positioning latch.

SECTION XII

Automatic Dial & Keyboard Clear

- 1 Align the three clearing cams at their left-hand extensions.
- 2 Adjust clearing cam bracket sidewise to obtain a very slight clearance between left-hand end of cams and rollers on clearing slides with slides held to left by clear trip link. Also, adjust bracket forward or rearward for approximately $1/64$ " clearance between rear end of dial clearing pawl and right-hand extension of dial clearing cam. Caution: After making this adjustment, check to see that clearing cams do not limit full movement of clearing slides to the right.
- 3 Guide and camming bracket for dial clearing pawl should be set to raise pawl above right-hand extension of dial clearing cam immediately after release of clear trip link during depression of "CX" key.
- 4 Adjust keyboard clearing pawl control link on division shaft to hold pawl with slight clearance above right-hand extension of keyboard clearing cam when division shaft and multiplication shaft are neutral.
- 5 With division shaft tripped, hand cycle machine and adjust keyboard clearing pawl on rock lever shaft for safe release of clear trip link latch.

SECTION XIII

Locks

- 1 Adjust guide bracket for "-X" and "-" key arms sidewise so that right-hand extension of bracket lays against "-X" arm without cramping it; then set "-" arm sidewise to lay against left-hand extension of guide bracket.
- 2 Move cross lock forward or rearward for a slight clearance of its forward edge behind "-X" key arm.
- 3 Set plus-minus shaft locking finger to center in cut at rear of cross lock with plus-minus shaft neutral, and also for locking finger to clear to left of cross lock by approximately $1/32$ " with division key restored.

SECTION XIII (Cont'd)

- 4 Adjust locking blank on right-hand end of plus-minus rocker shaft for cut in its front edge to center with off-set lug on rear of plus-minus lock slide.
- 5 Adjust stud in elongated slot of C.P. Set-Up key slide lock for very slight clearance from lower extension of set-up lock with set-up toggle fully broken.
- 6 Bend left-hand extension of C.P. Set-Up key slide lock forward or rearward so that full depression of any multiplication key will move slide lock rearward to point where its adjustable stud limits against lower extension of set-up lock.
- 7 Adjust right-hand extension of cross lock for full rearward movement of C.P. Set-Up lock when division key is depressed.

SECTION XIV

Tabulator Keys

- 1 Form lower ends of tabulator keys to conform to end carriage position tabulator stops.
- 2 Set plunger in shift trip pawl for approximately $1/32$ " clearance under end position tabulator stops.
- 3 Bend top of shift trip pawl to bring rear surface at top of plunger approximately in line with rearmost extension tabulator stops.
- 4 Check to see that shift trip pawl is moved rearward far enough by any tabulator stop for safe but not excessive release of shift control shaft. Bend top of shift trip pawl forward or rearward if needed for majority of stops and bend tabs for adjustment of individual positions. Caution: Excessive forward bending of the shift trip pawl may result in (1) jamming of plunger against a depressed tab, (2) with #2 and #9 tabs depressed, failure of the carriage to stop between extreme end positions and the 2nd and 9th positions.
- 5 It may be necessary to bend lower extensions of tabulator stops upward to prevent camming of shift trip pawl rearward when plunger in trip pawl is moved upward against lower edge of tabulator stops during depression of shift keys. Caution: Excessive upward bending of tabs may result in failure of carriage to stop between extreme end positions and second and ninth positions when #2 and #9 tabs are depressed as above.

An 929 - adjustable clutch-yoke stud ^{shank} should be
down - others should be up.

POINTS TO CHECK IN SETTING UP CAA-10s

1. Check adjustment of plus and minus rocker shaft for end play and balance of its latch.
2. Check adjustment of keyboard lock around machine rocker shaft.
3. Check trip and keyboard clearing from non-repeat kicker and set 67058 keyboard clearing disabling arm right or left for proper position.
4. Balance the 60-4346 locator cam to plus and minus bumper stroke limit positions thru its two 59588 hex headed adjusting screws.
5. Remove all end play from rocker shaft of 64052 toggle breaking arm and set arm to break the 60-7246 locator toggle when 60-772 cycle stop arm is just slightly away from bumper limit position. Have toggle break late enough to prevent cycle stop arm movement working against the spring action of 60-7246 toggle and caming surface of 60-4346 locator cam.
6. Level clear keys with Div'd tab key and make sure all clear slides are free and that clearance exists between pivot rivets of bell levers on right hand end of slides and that right hand end of bell levers are located correctly for engagement by dial clear out operating levers.
7. Bend upward extension of 60-7071 clear trip link latch to lay flat against left end of all clear slides and adjust knurled eccentrics of bell levers on right hand end of slides to release 60-7124 clear trip link approximately 1/16" before clear keys bottom and make sure index plate has been positioned fully forward at time dial clear function occurs.
8. Carefully bend rear offset of 60-7270 inside carriage return arm to break set up toggle at same time dial clearing occurs upon slow depression of div'd tab key. Spring the offset upward or downward carefully as it breaks easily.
9. Shift carriage out of 1st position, neutralize machine, raise outside return arm, hold cycle stop arm at bumper position and adjust upward extension of 64052 toggle breaker arm right or left for balanced clearance of 60-7073 shift rocker from either shift key pull down stud. Index plate forward and rearward.
10. With carriage out of 1st position and 67050 outside return arm raised, position clear drum half way thru a clearing cycle. With index plate rearward check to see that hub of shift reversing rocker limits against side frame and that rocker snaps to this position. Position index plate forward and check shift reversing rocker positioning for a full sidewise hold on stud of upper shift key and snaps to this position. Rocker must have good full hold in either position.
11. With carriage extreme left and right positions, raise 67050 outside return arm to latched position hold cycle stop arm at bumper and adjust rearward extension of 67201 shift disabler up or down for balanced clearance under and over 69089 flexible end of 69088 shift control bar.
12. Adjust outside return arm forward or rearward for balanced clearance of shift rocker arm from studs on upper and lower shift keys with index plate forward and rearward. This should give balanced hold of right

hand extension of shift reversing swivel under outside return arm with index plate rearward and forward and clear drum cycled half way.

13. From right hand offset of 67296 operating arm for 60-7274 return lever quick stroke latch to hold upward extension of forward quick stroke latch 1/64" away from offset lug on outside return arm.
14. Upon slow depression of div'd tab key check to see that outside return lever has raised high enough for safe entry of forward quick stroke latch under return lever offset before dial clearing and toggle breaking occurs and angle of offset does not cam quick stroke latch forward.
15. Check right hand extension of shift reversing swivel for safe clearance to move under outside return lever when lever is held up by forward quick stroke latch.
16. With outside return arm positioned on right hand extension of 60-9085 shift reversing rocker, check position of 67052 plus minus yoke throwing arm against rear end of outside return lever. Should be slightly on the coming angle of rear end of outside return arm.
17. Position 60-9118 return set up link ass'm downward operate machine to a power bumper stroke (shift drum operation) and see that stud on toggle breaking arm raises return set up link ass'm, beyond toggle point and that 69112 shift divorcing arm on 60-9112 has divorced set up key from 60-9112 ass'm during this movement.
18. Check set up adjustments as outlined in adjustment procedure.
19. Check carriage shift adjustments as outlined in adjustment procedure.
20. Check change lever adjustments as outlined in adjustment procedure.

- - - - -

UNIVERSITY OF
TORONTO
LIBRARY

